

Problem 8: your a wizard herry

6+6=12 Points

Problem ID: `tower`

Rank: 2+4

Introduction

Quickly! You've found yourself whisked into the whimsical world of the hit bestselling fantasy novel, *Herry Bother and the Filibuster's Moan*, and the one and only Herry needs your help! He's been trapped within one of Moldewort's signature creations—an elaborately-constructed circle of towers—and needs to destroy them all in order to escape! Although you're just a humble TikTok ASMR roleplay influencer, you have two things Herry doesn't: a basic understanding of grade-school arithmetic, and the ability to phish Moldewort's tower designs over email. It's up to you to save the day and bring Herry home as fast as possible!

Problem Statement

You're given N towers numbered $1, 2, \dots, N$ arranged in a circle. The towers have powers given by the sequence P_1, P_2, \dots, P_N , where P_i denotes the power of tower i . Adjacent towers are connected by paths of length D_1, D_2, \dots, D_N , where the distance between tower i and tower $i + 1$ is denoted by D_i , and the distance between tower N and tower 1 is denoted by D_N . Find the minimum amount of time needed to destroy all the towers.

Herry starts with a power of zero, which increases by one at the end of every hour. Upon arriving at a tower, he can destroy it instantly if he has a power equal to or greater than the power of the tower. Otherwise, he must wait inside the tower until his power matches that of the tower—after which he can destroy the tower instantly.

He can choose to start at any tower he wishes, and can walk at a pace of one unit of distance per hour. Once he begins, he can only travel around the circle in a clockwise direction—despite all of his magic, Herry was never taught as a child how to turn around.

Input Format

The first line of the input contains an integer T denoting the number of test cases that follow.

For each test case:

- The first line contains the single integer N denoting the number of towers in the circle.
- The second line contains the space-separated sequence of N integers P_1, P_2, \dots, P_N denoting the powers of the towers.
- The third line contains the space-separated sequence of N integers D_1, D_2, \dots, D_N denoting the distances between towers.

Output Format

For each test case, output a single line containing the minimum number of hours needed to destroy all the towers.

Constraints

$$1 \leq T \leq 100$$

Main Test Set

$$1 \leq N \leq 100$$

$$1 \leq P_i, D_i \leq 10^3$$

The sum of N across all test cases does not exceed 10^3 .

Bonus Test Set 1

Time Limit: **2 seconds** (This is twice the time of a typical problem because of larger inputs!)

Memory Limit: **500 MB** (This is twice the time of a typical problem because of larger inputs!)

$$1 \leq N \leq 10^5$$

$$1 \leq P_i, D_i \leq 10^6$$

The sum of N across all test cases does not exceed 10^5 .

Careful! If you are a Java or C/C++ programmer, be aware that the int variable type may be too small to contain P_i, D_i , or other values needed to solve the problem! Java programmers can use variable types long or float instead, and likewise long long or float for C/C++.

Sample Test Cases

Sample Input

[Download](#)

```
3
3
4 1 9
3 2 3
1
10
17
8
2 9 4 9 5 8 7 1
2 1 3 1 1 2 2 1
```

Sample Output

[Download](#)

```
9
10
17
```

Sample Explanations

Test Case #1:

The shortest times to destroy all towers from each starting point are:

- Tower #1, with $P_1 = 4$ (circled in red): 9 hours
- Tower #2, with $P_2 = 1$: 12 hours
- Tower #3, with $P_3 = 9$: 15 hours

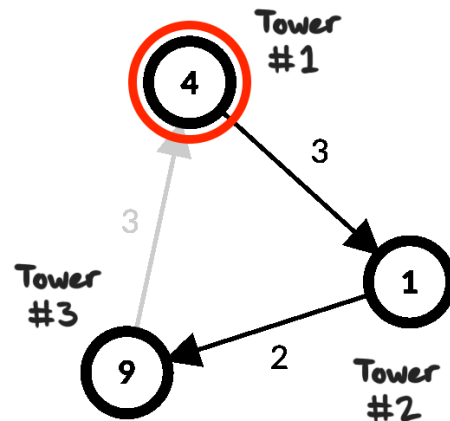
If Herry starts at tower #1 (circled in red), he can destroy all towers in 9 hours by:

- Destroying the starting tower in 4 hours,
- the next 3 hours after that,
- and the final tower 2 hours after that,

... finishing his journey at tower #3 after 9 hours.

Herry ends with a power level of 9—note that

Herry does not travel the gray path after destroying the last tower.



Test Case #2:

There is only one starting point—tower #1, with $P_1 = 10$. After 10 hours, Herry is able to destroy the only remaining tower. Note that Herry does not travel on any paths.

Test Case #3:

The shortest times to destroy all towers from the three best starting points are:

1. Tower #8, with $P_8 = 1$: 17 hours
2. Tower #3, with $P_3 = 4$: 18 hours
3. Tower #7, with $P_7 = 7$: 18 hours

If Herry starts at tower# 8 (circled in solid red), he can destroy all towers in 9 hours by:

- Destroying the starting tower in 1 hour,
- the next 1 hour after that,
- the next 7 hours after that,
- the next 1 hour after that,
- the next 3 hours after that,
- the next 1 hour after that,
- the next 1 hour after that,
- and the final tower 2 hours after that,

... finishing his journey at tower #7 after 17 hours. Herry ends with a power level of 17—note that Herry does not travel the gray path after destroying the last tower.

